Course Code	**:**	**BCS-012**
Course Title	**:**	**Basic Mathematics**
Assignment Number	**:**	**BCA(1)012/Assignment/2019-20**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Date of Submission	**:**	**15th October, 2019 (For July, 2019 Session)** **15th April, 2020 (For January,2020 Session)**

Answer all the questions in the assignment which carry 80 marks in total. All the questions are of equal marks. Rest 20 marks are for viva voce. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation. Make suitable assumption if necessary

Q1. Show that

$$\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & 0 \end{vmatrix} = 0$$

Where ω is a complex cube root of unity.

Q2. If $A = \begin{pmatrix} 3 & -1 \\ 2 & 1 \end{pmatrix}$, Show that $A^2 - 4A + 5I_2 = 0$. Also, find A^4.

Q3. Show that 133 divides $11^{n+2} + 12^{2n+1}$ for every natural number n.

Q4. If p^{th} term of an A.P is q and q^{th} term of the A.P. is p, find its r^{th} term.

Q5. If $1, \omega, \omega^2$ are cube roots of unity, show that
$(2-\omega)(2-\omega^2)(2-\omega^{19})(2-\omega^{23}) = 49$.

Q6. If α, β are roots of $x^2 - 3ax + a^2 = 0$, find the value(s) of a if $\alpha^2 + \beta^2 = \frac{7}{4}$.

Q7. If $y = In\left(\frac{\sqrt{1+X} - \sqrt{1-X}}{\sqrt{1+X} + \sqrt{1-X}}\right)$, find $\frac{dy}{dX}$.

Q8. If $A = \begin{bmatrix} 2 & -1 & 0 \\ 1 & 0 & 3 \\ 3 & 0 & -1 \end{bmatrix}$, show that $A\,(adj.A) = |A|\,I_3$.

Q9. Find the sum of all the integers between 100 and 1000 that are divisible by 9

Q10. Write De Moivre's theorem and use it to find $(\sqrt{3} + i)^3$.

Q11. Solve the equation $x^3 - 13x^2 + 15x + 189 = 0$,Given that one of the roots exceeds the other by 2.

Q12. Solve the inequality$\left|\frac{2}{X-1}\right| > 5$ and graph its solution.

Q13. Determine the values of x for which $f(x) = x^4 - 8x^3 + 22x^2 - 24x + 21$ is increasing and for which it is decreasing.

Q14. Find the points of local maxima and local minima of $f(x) = x^3 – 6x^2 + 9x + 2014$, $x \in \mathbf{R}$.

Q15. Evaluate : $\int \frac{dx}{(e^x - 1)^2}$

Q16. Using integration, find length of the curve $y = 3 - x$ from (-1, 4) to (3, 0).

Q17. Find the sum up to n terms of the series 0.4 + 0.44 + 0.444 + …

Q18. Show that the lines $\frac{X-5}{4} = \frac{y-7}{-4} = \frac{z-3}{-5}$ and $\frac{X-8}{4} = \frac{y-4}{-4} = \frac{z-5}{4}$ Intersect.

Q19. A tailor needs at least 40 large buttons and 60 small buttons. In the market, buttions are available in two boxes or cards. A box contains 6 large and 2 small buttons and a card contains 2 large and 4 small buttons. If the cost of a box is \$ 3 and cost of a card is \$ 2, find how many boxes and cards should be purchased so as to minimize the expenditure.

Q20. A manufacturer makes two types of furniture, chairs and tables. Both the products are processed on three machines A1, A2 and A3. Machine A1 requires 3 hours for a chair and 3 hours for a table, machine A2 requires 5 hours for a chair and 2 hours for a table and machine A3 requires 2 hours for a chair and 6 hours for a table. The maximum time available on machines A1, A2 and A3 is 36 hours, 50 hours and 60 hours respectively. Profits are \$ 20 per chair and \$ 30 per table. Formulate the above as a linear programming problem to maximize the profit and solve it.